CLAIMS

What is claimed is:

1. A porous article having an exterior surface, a bulk matrix and pores extending from the exterior surface into the bulk matrix, wherein the pores define an interstitial surface, wherein the bulk matrix is formed, at least in part, of an organic polymer comprising carbon and hydrogen atoms, and the exterior and interstitial surfaces are formed, at least in part, of the organic polymer comprising carbon and hydrogen atoms wherein some of the hydrogen atoms are replaced with functional groups selected from amino, hydroxyl, carbonyl, and carboxylic acid, and wherein the exterior surface does not display appreciable surface roughness, according to SEM analysis, due to ablation of surface carbon atoms or chain scission.

2. The porous article of claim 1 wherein amino groups are directly and covalently bonded to the polymers which form the interstitial surface.

3. The porous article of claim 1 wherein the functional groups are predominantly hydroxyl groups.

4. The porous article of claim 1 wherein the polymers which form the bulk matrix comprise polyolefin, and the polymers which form the exterior and interstitial surfaces comprise hydroxyl-substituted polyolefin.

5. The porous article of claim 1 wherein the polymers which form the bulk matrix comprise polyolefin and the polymers which form the exterior and interstitial surfaces comprise amino-substituted polyolefin.

6. The porous article of claim 1 having a void volume of from 1% to 90%.

7. The porous article of claim 1 having a void volume of from about 35% to 60%.

8. The porous article of claim 1 having an effective pore diameter of about 0.01 microns to 2000 microns.

9. The porous article of claim 1 having an effective pore diameter of about 1 to about 50 microns.

10. The porous article of claim 1 in the form of a membrane.

11. The porous article of claim 1 wherein the bulk matrix is formed from sintered polyolefin.

12. The porous article of claim 1 wherein the average pore size on the exterior surface is within 1% of the average pore size within the matrix of the article.

13. The porous article of claim 1 which is hydrophilic at all points of the surface.

14. The porous article of claim 1 having surface functionality in the amount of 10^{-12} to 10^{-10} moles/cm^2.

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15. A process for introducing functionality to the surface of a porous article, comprising the steps of:

providing a precursor porous article having an exterior surface, an interstitial surface and a bulk matrix, the surfaces and bulk matrix both comprising organic polymers; and

exposing the precursor porous article to a remote discharge formed by radical forming conditions acting on a source gas, the source gas selected from the group consisting of oxygen, ammonia and a mixture of nitrogen and hydrogen, under reaction conditions such that radicals from the discharge react with the organic polymers present at the exterior and interstitial surfaces of the precursor porous article to introduce direct covalent bonding of functionality to the surfaces, the functionality selected from the group consisting of amino, hydroxyl, carbonyl and carboxyl groups.

16. The process according to claim 15 wherein the discharge is a remote plasma discharge.

17. The process according to claim 15 wherein ultraviolet radiation generated by the radical forming conditions does not contact the precursor porous article.

18. The process according to claim 15 wherein the source gas comprises ammonia.

19. The process according to claim 15 wherein the source gas comprises oxygen.

20. The process according to claim 15 wherein the porous article comprises polyolefin.

21. The process according to claim 15 wherein the precursor porous article has a pore volume which is within 10% of the pore volume of the surface-functionalized porous article.

22. The process according to claim 15 wherein the surface-functionalized porous article is reacted with a reducing agent, so that hydroxyl groups are the predominant functional group bonded to the polymers which form the surface of the article.

23. The process according to claim 15 wherein precursor porous article is exposed to the remote discharge under a pressure of about 1 to about 10 Torr.

24. The process according to claim 15 wherein the functionality is distributed across the entire exterior and interstitial surfaces.

25. The process according to claim 15 further comprising the step of treating the functionalized surface with a chemical agent that eliminates surface free radicals or organic peroxides.

26. The process according to claim 25 wherein the agent is selected from the group consisting of ammonia gas, dimethyl sulfide, a hindered amine light stabilizer, BHT and antioxidants.

27. A surface-functionalized porous article prepared by a process comprising the steps of:

providing a precursor porous article having an exterior surface, an interstitial surface and a bulk matrix, the surfaces and bulk matrix both comprising organic polymers; and

exposing the precursor porous article to remote discharge formed by radical forming conditions acting on a source gas, the source gas selected from the group consisting of oxygen, ammonia and a mixture of nitrogen and hydrogen, under reaction conditions such that radicals from the discharge react with the surfaces of the precursor porous organic article to cause direct covalent bonding of functionality to the surfaces, the functionality selected from the group consisting of amino, hydroxyl, carbonyl and carboxyl groups.

28. The surface-functionalized porous article of claim 27 wherein the discharge is a plasma discharge.

29. The surface-functionalized porous article of claim 27 wherein precursor porous article comprises polyethylene.

30. The surface-functionalized porous article of claim 27 wherein the precursor porous article comprises sintered particles of non-porous polyethylene.

31. The surface-functionalized porous article of claim 27 wherein the precursor porous article has a pore volume of 35% to 60%.